



OCTOBER 6, 1981 NOMBER 40 TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

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EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

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Editorial

Nominating Fellows

For the past 20 years, AGU has elected a few Members each year to the grade of Fellow in recognition of their outglanding contributions to the various branches of geophysics. The bylaws of AGU stipulate that only Members of AGU may be elected Fellows and that the number elected in a given year shall not exceed 0.1% of the then current nembership of AGU. At present there are 379 Fellows. For many years nominations for Fellowship have been requested from the membership at large. To encourage more active participation on the part of all sections of AGU

so well as by those unaffillated with any section, the Coundi (May 24, 1981) adopted the following procedure. 1. Nominations are to be sent to the Fellows Committee through the respective section presidents or through their

ssignated committee. 2. Nominations of Individuals unaffillated with any section may be sent directly to the Fellows Committee.

3. Each section may submit at most three nominations to the Fellows Committee.

It is intended that the sections serve both as initial reylewer of the nominations and as an advocate for their selactions. The Fellows Committee will maintain a list of past mminations but not of their supporting statements. Thus any previous nominations must be resubmitted as a new

By this procedure it is hoped that there will be a better sectional balance of nominations.

It appears that some sections have been much more active than others over the past 10 years in nominating and promoting the selection of their candidates. The fact that the Planetology and Solar-Planetary Relationships sections have large numbers of Fellows elected in recent years, when compared with the percentage of the total member-

ship affillation in those sections, may also reflect the pace of research in these areas. The number of Fellows elected during 1971-1981 is shown in Table 1 as is the percentage for primary section affiliation for the total membership. Between 1962 and 1971 It was AGU's practice to select automatically as AGU Fellows those members who were electof Fellows of the National Academy of Sciences and the National Academy of Engineering. An imbalance from the large initial selection of Fellows in 1962 resulted. One hunfied twelve of these Fellows are still current members and



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Gover. Field lines in the Jovian magnetosphere (heavy lines) and contours of constant B magnitude (light lines) based on a model of Juntania flow in an equ model of Jupiter's azimuthal current disc. Currents flow in an equal total angular state orbit of ional annulus of width 5 $R_{\rm s}$, extending from 5 $R_{\rm s}$ (near the orbit of b) in $R_{\rm s}$ $R_{\rm s}$ $R_{\rm s}$ b) to 50 R_J, approximately 100 million amperes in all. (Figure from J.E.P. Connerney, based on a model from his article in the spedal Voyager Issue, *J. Geophys. Res.*, 86 (A10), 1981:)

Correction

Voyager advertisement, EOS 9/29/81, page 682 should read 'Voyager Missions to Jupiter.' See corrected ad this issue page 698.

(ABLE 1. Fellows as a Percentage of Affiliation

	Membership Afilliation By Section, percent	Ву	Elected 1971–1981,	Fellows Selected In 1962, percent
Geodesy	4	5	8	
Geomagnetism and	l ' '	•	·	•
Paleomagnetism	5	6	6	5
Hydrology	17	8	ě	ĕ
Meteorology	8	11	ě	18
Oceanography	13	9	11	5
Planelology	5	9	ġ	9
Seismology	10	11	ě	10
Solar-Planetary			•	
Relationships	12	17	20	16
Tectonophysics	9	10	11	8
Volcanology, Geochemistry,	·		••	Ū
and Petrology	10	12	9	18
None	7	2	3	4

comprise 30% of the current Fellows. Although considerable improvement in the balance among sections has been achieved since that time, the problem has by no means been completely rectified. The fourth column shows the percentage of Fellows by section for those that became Fellows before 1963 and are still members.

Fellows' nominations must be made on forms available from AGU, 2000 Florida Avenue, N.W., Washington, D.C.

20009 (lelephone: 202-462-6903 or toll free 800-424-2488). The time schedule for the 1982 election of Fellows is as follows; October 1981, call for nominations now appearing in Eos; November 15, 1981, deadline for nominations to section presidents; January 15, 1982, deadline for nominations to Fellows Committee; April 15, 1982, deadline for citations; June 1, 1982 (tentative), honors ceremony in Phila-

> Nicholas C. Matalas Chairman, Fellows Committee

News

Space Telescope Leads a New Generation

The Space Telescope, approved for a space shuttle launch in 1985, will resolve visible and ultraviolet light orders of magnitude better than earth-based telescopes. Even though its aperture of 2.4 m will be less than half of the aperture of the reflector at Mt. Palomar, it is considered relatively large and immensely superior to existing orbiting telescopes. It is expected that the Space Telescope, with ils freedom from thermal litter and the hindrance of atmospheric absorption, will increase the user load on larger aperture earth-based telescopes, and construction of a new series of large telescopes is now in the planning stages. The National Academy of Sciences is expected to release shortly a report by its Astronomy Survey Committee, headed by George Field of the Harvard-Smithsonian Observatory, that will recommend building a 15-m optical-infrared 'National Telescope' [Phys. Today, August 1981, p. 17]. In addition, a 7.6-m single reflector is planned at the University of Texas, a 10-m segmented reflector is planned at the University of California, and the University of Arizona is experimenting with designs of a Multiple-Mirror Telescope (MMT) larger than their new 4.5 m (equivalent) MMT. All of these are larger than the Russian 6-m telescope, whose Pyrex reflector has not performed well, apparently because of gravitational sag and thermal Inertial stresses.

Discussions of the planned Space Telescope [i.e., J. Bancall and C. O. Dell. The Space Telescope observatory. J. Astron. Sci., 28, 107, 1980] are mostly technical, the main objectives being new (unidentified) discoveries in space. Not only will the telescope be equipped with an array of high resolution and 'faint-object' spectrographs, photomer, and cameras, but instruments will be installed in space by astronaut-operators to accommodate new projecis and for updating purposes. Every 5 years the observatory will be returned to earth for a refit.

The orbiting telescope will not make the earth-bound telescopes obsolete but will act as a forerunner for new discoveries in space. The high angle resolution range will be explored, and the accuracy of the spacecraft's fine guidance system will contribute greatly to the observations. It is pointed out that the smaller collecting area of the Space Telescope reflector is significantly slower than larger aperture earth telescopes (except for faint objects). Hurlan Smith, chairman of the Associated Universities for Research in Astronomy, has said that because the operational Space Telescope costs are a factor of 10 higher than earth-based telescopes, 'each photon in space will cost a hundred times more than those gathered on the ground' [Phys. Today, August 1981, p. 17].
The proposed new telescopes will depend on new tech-

nology to overcome problems arising from the large stresses on the high precision reflecting mirrors. Surfaces must not deform by more than 10⁻¹ μm over the 7- to 10-m diameter. New mounting techniques, new materials, and new weight-saving techniques will be used to conserve rigidity able sources of gravitational stress concentrations. Comof the reflectors by avoiding puters will be used for complex requirements of tracking and for matching alignment of multiple mirror systems. Special glasses and other materials will be employed to overcome thermal stresses. New lens grinding procedures using interferometric laser beams are more accurate than before, and it may be possible to obtain f stop configurations of an order of magnitude lower than those possible by previous methods. Fourth-order parabolic surfaces are difficult to grind, and several new techniques will be attempted.

Operation techniques of the new telescopes will be devised to take advantage of the gravitationally stable, low thermal-inertia surfaces. The multiple-mirror telescopes may use an oscillation technique to cancel the atmospheric litter caused by clear-air turbulence. Images defined accurately by the space telescope may provide reference callbration for observations on the ground, and thus they can be used as continual references during a given observa-

The new era of telescopes will begin with the launching of the Space Telescope in 1985. The larger ground-based telescopes will probably not be in operation before 1990. The applications and goals, in addition to improving present observations, include obtaining new values for astronomic distances, searching for new planets outside of our solar

New JGR-Blue Editor

As of October 1, 1981, all new manuscripts for the Journal of Geophysical Research, Blue, are to be sent to Bengt U. Ö. Sonnerup, Thayer School of Engineering, Dartmouth College, Hanover, NH 03755.

system, observing giant and supergiant stars, making new spectral measurements of quasars, studying interstellar maller, and measuring stellar brightness.—PMB 🕉

Ariane: NASA's European Rival

The successful test launch of two three-quarter ton satellites in the European Space Agency's (ESA) Ariane rocket last June firmly placed ESA in competition with NASA for the lucrative and growing satellite launching market. Under the auspices of the private (but largely French-government linanced) Arianespace company, ESA is already attracting customers to its three-stage rocket by offering low costs.

According to recent reports (Nature, 292, pp. 785 and 788, 1981], Arianespace has been able to win several U.S. customers away from NASA, including Southern Pacific Communications, Western Union, RCA, Satellite Television Corporation, and GTE. Nature [292, 1981] magazine in an article entitled 'More Trouble for the Hapless Shuttle' suggests that it will be possible for Ariane to charge lower prices for a launch than NASA, even with the space shuttle.

It is noted that the shuttle is far behind schedule, and its near-future flights may be subjected to great demand for milliary projects. The costs of placing a three-quarter-ton satellite into geostationary orbit are about \$28 million by ESA with Ariane and about \$35 million by NASA with the Thor Delta rocket system. The analogous costs of the

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Call Toll Free 800 424-2488 outside of the Washington, D.C. area space shuttle are about half Delta's costs per satellite, but the shuttle's costs are rising.

Another test of the three-stage Ariane is due in November. if successful, ESA plans to run five flights per year. gradualing to 10 or more per year. Expanded launch facilities in French Gulana will be constructed to handle the increased payloads of advanced versions of the Ariane rocket. The present rocket is capable of handling a combined total payload of 17000 kg. New versions of the rocket will have increased thrust and booster rockets. The payload will be increased first by about 15%; a third version will carry

The satellite business is complex. Telecommunications and cable television satellites are the most lucrative. Factors in the costs introduced by scientific and military payloads are difficult to assess. A part of the cost derives from reliability and backup systems. (During the second, unsuccessful flight of Arlane in 1980 two German satellites were lost, a scientific probe named Firewheel and the Oscar 9 amateur-radio relay.) The Arianespace Company is owned and financed by European aerosaoce corporations, various European banks, and the French space agency. With government participation in the launching business, the charges for placing a satellite into orbit may not reflect the true costs.

The impact of Ariane on U.S. space science may be in the form of support of NASA's programs. In the offing are joint projects with ESA, such as the International Solar Polar Mission (ISPM), whose budget is now being considered by the White House and Congress. St

Marginal Ice Zone Processes

As a follow up to a special session on marginal ice zone (MIZ) processes (Eos. 62, September 1, p. 652), a collection of papers on MIZ is being planned for the Journal of Geophysical Research. Deadline for submission of manuscripts for the special collection is April 1, 1982.

Manuscripts should be sent to the coeditor of JGR. Oceans and Atmospheres, A. D. Kirwan, Jr., Department of Marine Science, University of South Florida, 140 Seventh Ave. South, St. Petersburg, FL 33701. Authors are requestad to specify that manuscripts are for the special MIZ is-

Additional information on the MIZ Issue of JGR and on the special Fall Meeting session can be obtained from Robin D. Muench, Coordinator, JGR/MIZ issue, SAI, Northwest, 13400B Northrup Way #36, Bellevus, WA 98005 (lelephone: 206-747-7152). 83

Geothermal Drilling

A geothermal test hole drilled into the summit crater of Newberry Volcano in Oregon measured 190°C at 810 m. This is the hottest temperature measured and reported so far in Oregon, not for all geothermal test holes in the United States, as reported in the September 15 issue of Eos.

Edward Sammel, a U.S. Geological Survey hydrologist, is the leader of the geothermal drilling project at Newberry. David Blackwell of Southern Methodist University was incorrectly reported to be the project leader; he made the temperature measurements in the hole. Additional drilling has penetrated deeper and to higher temperatures. 🥸

Candidates for JGR-Red Editor Sought

Thomas J. Ahrens will complete his term as editor of the Journal of Geophysical Research-Red at the end of 1982. A selection committee has been appointed to recommend candidates to the AGU president. Nominations for the editor for the red section of JGR for the term 1983-1986 are now being accepted. Those who are interested in serving as editor, or who wish to suggest candidates, should send recommendations by February 15, 1982, directly to

> American Geophysical Union 2000 Florida Avenue, NW. Washington, D.C. 20009 Attention: JGR Search Committee

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800-424-2488 462-6903 in the Washington, D.C. area.

Geophysicists

Allen W. Hatheway, professor of geological engineering at the University of Missouri in Rolla, has been selected by the Geological Society of America as the 1981 recipient of the E. B. Burwell, Jr., Memorial Award for Oustanding Contributions to Engineering Geology. The award will be presented at the GSA annual meeting in November.

Elizabeth Rona, died on July 27, 1981. She joined AGU

H. W. Straley, III, a Life Member, died on October 12. 1979. He joined AGU in 1932.

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Research Position in Chemical Oceanogra-phy. California institute of Technology, Division of Geological and Planetary Sciences. The position of research fellow is being offered at Califech for rewarch in oceanography. Investigation of the isotop-composition of neodymium and rare earth abundances in sea water and sediments is now being carled forward. The mechanism of injection of REE ing sea water will be studied. The differences in "Mo" Mo in various water masses [Piepgras et al, Earth and Planet Sci. Lett. 45, 223-236 and Pergras and Wasserburg, Earth and Planet. Sci. Let 50, 128-138 (1980)] is now being carried forward as an exploratory venture in order to determine the origin and chemical behavior of REE in the cean and the potential use of 143Nd/144Nd as at tace. The laboratory facilities for sample prepa-ation and analysis are fully functional and will be salable. Applicants should have training in oceanoyruphy and a good perspective on general physi-

ci coanographic models.

Send resume and references to Professor G. J.

Waterburg. Lunatic Asylum, California Institute of Technology, Pasadena, CA 91125. Catech is an equal opportunity/affirmative action

Paillen in Reflection Seismology/Rice University, Houston, Texas. The Department of Geology plans to expand its geophysical program. Emphasis will be on reflection seismolo-M this time applications are for the first of two
 M first positions. The successful applicant will
 the search for and selection of the second

acity member.
Your main responsibility will be to lead our de-farment into the area of modern reflection sele-Fology. Your main teaching and research interests should be in the acquisition and processing of reecton saismic data. You should also help in de-velong rigorous undergraduate and graduate cur-lots, which are supported by the traditional though of the Math Sciences, Physics, and Electri-cal Engineering Departments at Rice. Enthusiasm to work with and undertake some joint projects with Our plans are to acquire a computer system con-

Our pans are to acquire a computer system con-leted money for this facility is already in hand. Cre-tice cooperation with the oil and geophysical in-duty in Houston, including a reasonable amount of consulting, is encouraged. Salary will be com-mensurate with qualifications and experience. Please send your curriculum vitae, a summary of serial your curriculum vitae, a summary of speriance in selamic processing, a statement of fessarch intersets, and names of three or more references to Dr. A. W. Bally, Chairman, Department of Geology, Rice University, P.O. Box 1892, Housto, Texas 77001. Application deadline—December 1, 1981.

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Field Research Positions. The Exploration Research Laboratory of the Colorado School of Irana Research Positions. The Exploration fessarch Laboratory of the Colorado School of Vises may have openings for a field party manager and or an assistant lield party manager on or about January 1. 1982. Position level will be negotiated based on qualification. This position in the person may puricipate in a wide range of field activities including restrictly, gravily and magnetics, etc. This is an opportunity to participate with a large geophysics research and development group. Specific responsibilities include planning and coordination of field wirk, training of crew members, and supervision of perprocessing. The position is most challenging and cliers wide scope for initiation and acceptance of responsibility. Interaction with industry professionals, ERL staff, and (aculty members of the Devance of Geophysics is required. It is a position of growth, and challenge. A bachelorae or measters degree is required for each of the positions. Field one experience would be helpful. Ability to direct ow experience would be helpful. Ability to direct shortinets, interface with diverse groups, and committee required for the Assistant Field Manager. Schedules are not firm and are subject to research to minimum and research the commitments and research the commitments. careoules are not firm and are subject to research tomnitments and research time frames. Typical abations and experiment fringe benefits are available if interested in further details or in submitting an application, contact Dr. James K. Applegate, Director, Exporation Research Laboratory, Colorado Sohool of Mana, Golden, Colorado 80401.

The Colorado School of Mines Is an affirmative action/equal opportunity amblover. opportunity employer.

Physical/Coastal Oceanographer. The Center for Coastal Studies, Scripps Institution of Oceanography, has an opening for a physical, coastal oceanographer to conduct research in an ongoing program of innovative sediment management technicing with emphasis on extinent management technicing with emphasis or extinent as ment technology with emphasis on sediment re-sponse to the forcing functions of waves, winds and currents. The incumbent will select and publish on research projects into fundamental physics of coastal and harbor sedimentation and advance al-ternatives to current coastal enclassives as ternatives to current coastal engineering practices.

rematives to current coastel engineering practices. Appointments are for 1 or 2 years (renewable) at the postgraduate research or assistant research level. Cualifications for postgraduate research level are PhD or equivalent in physical oceanography/ coastal processes and/or applied physics/mechanics with emphasis on granular/fluid mechanics. Appointment at the assistant research level requires the above qualifications and a demonstrated publication record. Salary from \$18,138 to \$25,200 commensurate with qualifications. Submit letter of intermenaurate with qualifications. Submit letter of interest including resume and at least three names of references before t December 1981 to: Dr. D. L. Inman, Director, Center for Coastal Studies, Scripps institution of Oceanography, University of California at San Diego, La Jolla, California, 92093, Request position profiles at the same address.

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Geophysical Sciences. Five faculty positions available in the next two to three years; two anticipated for fall 1982. Applications are invited for two tenure-track positions in geophysics, one in paty-nology, one in micropaleontology, and one in sediment geochemistry. Ph.D. required by time of appointment. Successful candidates will be expected

pointment. Successful candidates will be expected to teach graduate and undergraduate courses in area of expertise, develop a research program, and participate in teaching introductory geology.

At least one of these positions may be filled at the Associate Professor rank or above. Satary range is \$19,000-\$35,000 depending upon experience and field of research. Applications are encouraged from individuals with industrial experience as aged from individuals with industrial experience as well as recent graduates. Although all areas of geo-physics will be considered, preference will be given ssionals with teaching and research interests in seismic stratigraphy and petroleum explora-

Candidates for the palynology position should have research interest in Genozolc/Mesozolc bio-stratigraphy with preference given to those specializing in nannofossile. Candidates for the sediment geochemistry position should have interests in one or more of the following areas: organic geochemis-try/geochemical petroleum explorations, or isotope

ODU is a slate-supported University of 15.000 students situeted in the metropolitan Hampton Roads area. Send vitae, a brief discussion of research interests, and arrange to have three letters of reference sent by February 15, 1982 to Dr. Randall S. Spencer, Chairman, Department of Geo-physical Sciences, Old Dominion University, Nor-tolk, VA 25508.

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University of Tennessee, Knoxylle:Faculty Positions. The Department of Geological Sciences (Main Campus of the UT System) invites applications for two or three tenure track teaching/ research positions effective September 1, 1982.
The appointments will be at the assistant or as-

sociate professor level in:

1. Sedimentology or Low-Temperature Geo-

chemistry

2. Metamorphic Petrology or Mineralogy.

The Ph.D. is required. Duties will include pursuit of an active research program as well as teaching and advising at graduate and undergraduate levels. Preference will be given those with documented research capabilities. Applicants will be interviewed at the Cincinnati G.S.A. meeting. Send resume (including transcripts) and names of 3 referees to: Thomas W. Broadhead, Search Committee, Department of Geological Sciences, University of Tennessae, Knoxville, TN 37916. Application deadline, January 15, 1982.

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Directors Geodetic Survey, NOAA. The National Oceanic and Atmospheric Administration (NOAA) announces a Senior Executive Service Value. (NOAA) announces a semil Executes of the variety for the position of Director, Geodetic Research and Development Laboratory (GRDL) in the National Geodetic Survey, a component of the National Ocean Survey. The duty location is Rockville, the CAT MRD. SED. 112.50 Maryland. The salary range is \$47,889-\$50,112.50 per annum. Duties include providing technical and administrative aupervision over employees and ac-tivities of GRDL; advising officials on the state of scientific knowledge in geodesy and making recom-mendations for research and development; exercis-ing scientific and technical knowledge of contibut-ing publications to protessional journals and making presentations at national and international meetpresentations at nettonal and international meetings; and advising and consulting scientists and exings; and advising and consulting scientists and exitives in improvement of geodesy and relating programs, geodesy, and solid sarth actences is required. Apply to: NOAWNOS-8001 Executive Boulevard, Plockville, Maryland 20852. Attn. MB/ NOAA is an equal opportunity employer.

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Faculty Positions: Earth Sciences. SUNY Stony Brook is seeking candidates for tenure track appointments in the Department of Earth & Space Sciences, with emphasis on active research experience and an interest in teaching graduate and undergraduate students. Bank and select an depart of departs. lergraduate students. Rank and salary are depondent on experience and qualifications. Areas of specialization are open since we are tooking primarily for high-caliber applicants, but preference will be given to applicants with research experience in one or more of the following: Structural Geology, Tectonophysics, Geophysics, Mineralogy, Petrology, Geochemistry, and Mineral Resources. Qualifled persons should send resume to Prof. Gilbert N Hanson, Department of Earth & Space Sciences, SUNY Stony Brook, Stony Brook, NY 11794.

native action employer. AK#140 B. University of Maryland/Faculty Position. The University of Maryland invites applica-tions from highly qualified scientists for a tenure track faculty position at the assistant or associate professor level in the Department of Meteorology. Candidates must have a Ph.D. in meter physics, engineering or chemistry and have an area of specialization that will enable them to lead a research program in environmental physics and air pollution. The research activity of the candidate ahould complement the meteorological research of the Department and continue the strong interaction in the physical sciences across departmental lines Duties will include teaching senior/graduate courses related to environmental physics and air pollution and developing an active research pro-gram. Salary will be commensurate with qualifica-tions and experience. All applicants should send

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curriculum vitae, a brief statement of research inte

ests and names, addresses and telephone num-bers of those professional references to: Professor Ferdinand Baer, Chairman, Department of Meteo-

rology, University of Maryland, College Park, MD 20742. Closing date for applications is 1 December

Groundwater Hydrologist. The Minnesola Department of Natural Resources. Division of Waters has a vacancy at the Principal Hydrologist level for an experienced groundwater hydrologist to pro vide leadership for a program of ground water studles and monitoring to support State Water alloca-tion decisions and to provide quantilative assessments for planning and management purposes Address inquiries and requests for application Third Floor Space Center Building, 444 Lafavalle Road, St Paul, Minnesola, 55101 Present salary range: \$23,323 to \$31,132 annually, subject to revision in the near future.

Faculty Positions Environmental Engineer-ing. Beginning January or September 1982. The position requires undergraduate and graduate teaching and sponsored research activities in the areas of water quality control and water resources. An earned doctorate is required and at least one dogree in civil engineering is preferred. Rank will be at the assistant professor level and salary will depend upon qualifications. Apply to: Dr. Lester A. Hoel, Chairman, Department of Civil Engineering, University of Virginia, Chartottesville, Virginia

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EARTH SCIENCES -

The Lamont-Doherty Geological Observatory of Columbia University invites scientists interested in any field of the earth sciences to apply for the following fellowships: two postdoctoral fellowships, each awarded for a period of one year (extendable to two years in special instances) bealnning in September 1982 with a stipend of \$22,500 per annum. Completed applications are to be returned by January 15, 1982. Application forms may be obtained by writing to the Director, Lamont-Doherty Geological Observatory, Pal isades, New York 10964. Award announcements will be made February 28, 1982 or shortly thereafter. The Observatory also welcomes applications from candidates for postdoctoral research associate positions in this discipline.

Visitor Appointments: NGAR, Visitor Ap pointments at the High Altitude Observatory are allable for now and established Ph D s for up to one year periods to carry out research in solar physics, solar-torrostrial physics, and related subjects. Applicants should provide a curriculum vitae including education, work experience, publications. the names of three scientists familiar with their work, and a statement of their research plans. Applications must be received by 15 January 1982. and they should be sent to Visitor Committee, High Altitude Observatory, National Center for Atmospheric Research (NCAR), P.O. Box 3000, Boulder Colorado 80307 NCAR is an equal opportunity at-

New Publications

Geophysical Aspects of the Energy Problem

A. Rapolia, G. V. Keller, and D. J. Moore (Eds.), Elsevier,

New York, xiv + 325 pp., 1980, \$67.75. Reviewed by Herbert F. Wang

Geophysical Aspects of the Energy Problem is a collection of papers resulting from a short course of that title held at the School of Geophysics of the 'Ettore Majorana' International Centre for Scientific Culture, Erice, Italy, during June 1978. Many papers have a European flavor in the choice of examples and literature citations. One encounters

monetary units from rubles to dollars. The primary emphasis is on geothermal energy with a polpourti of other topics ranging from geochemistry of uranium to atmospheric dispersion of contaminants from power plant stacks. The only way to give an idea of the contents is to go to a chapter by chapter description. However, I must warn potential readers of the shoddy appearance of a book listed at \$67.75. The book looks like class handouls. It contains numerous typographic errors, uneven spacing, and mislabeled graphs. It lacks running heads. I could give the editors several pages of errata.

The first six chapters, which make up two-thirds of the book, are devoted to geothermal energy. The first chapter by J. Goguet is entitled 'Thermodynamic Aspects of Geothermal Energy. The paper opens somewhat grandiosely: 'Since Prometheus, man has striven to divert for his use part of the natural flows of energy. To make any further advance we must understand and analyse (sic) all aspects of the natural flow and budget of energy for our Earth, or better, for the universe as a whole.' The first half of the chapter surveys the energetics of solid earth processes. Since no references are given for the material in the chapter. checking statements and numerical values is difficult. For example, what can be made of a sentence, 'We must not forget that the average value of gravity differentiation energy in the formation of the core, (sic) is 18 × 10 kW. The second half of the chapter dealing with manifestations of geothermal energy is much better. The section on phreatic explosions presages Mount St. Helens by indicating that an explosion can be triggered by a rock slide at the surface.

The second chapter by G. V. Keller on 'Geophysical Methods in Prospecting for Geothermal Resources' is one of the best in the book. The chapter consists of a balanced review of geophysical methods, especially electrical methods, and case histories. A definition of 'bipole' as a long dipole' would have been useful. Given the typewritten production of the book, it seems as if 1978 references in press could have been updated by Keller.

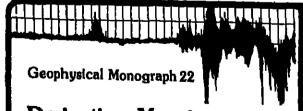
The third chapter by F. Mongelli is entitled 'Geothermal Prospecting for Geothermal Fields,' but in actuality it is a discussion of thermal conductivity measurements and their use in establishing thermal profiles.

The next three chapters are oriented toward specific geothermal systems. J. Varet classifies low enthalpy geothermai fields in France, A. C. Gringarten discusses a mathematical model of heat extraction in a hot dry rock system. and Y. D. Diadkin describes similar modeling efforts in the

Soviet Union. His chapter also includes an interesting discussion of an economic mathematical model, which reflects the economic principles and prices as adopted in the USSR. The chapters by Diadkin and Gringarten point out some of the tack of editing in this book. Diadkin in his equation 26 quotes equation 27 in Gringarten's chapter, but with different notation and a typographical error.

The nongeothermal chapters of the book open with a discussion of 'Physical and Geophysical Aspects of Solar Energy' by V. Silvestrini. This chapter describes spectral properties of solar radiation, selective covers for both solar heating and cooling, and the use of climate data for architectural design. A philosophy akin to Ian McHarg's Design with Nature appears here and there in the chapter. 'We do not aim for solutions which imply that technology is incompatible with nature; the general attitude must be reversed, and starting from a study of the environmental conditions we have to adapt technology to the environment." Because Farrington Daniels' Direct Use of the Sun's Energy is one of my favorite books covering some of the same ground as this chapter. I was disappointed that it was not given in the references.

The next chapter by P. Gasparini and M. S. M. Mantovani on 'Geochemistry and Geology of Uranium Deposits' was concise and readable, but one wonders why it was in a book on 'geophysical aspects.'



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son of the 'safe shut-down earthquake' versus the 'operating base earthquake,' In this subject, as in others discussed in this book, differences occur between European and U.S. approaches.

A. Castellani discusses 'Earthquakes and Security of Nv-

clear Plants.' The discussion is devoted mainly to compan-

The final chapter by D. J. Moore is on 'Almospheric and Water Pollution from Power Plants.' An extremely broad subject is covered, and necessarily much is skimmed light-A general idea is conveyed about the role of atmospheric layering and dispersion on the transport of flue gases from conventional power plants. Plant cooling by discharge

into estuaries or cooling ponds is also discussed. Despite the several shortcomings of the book, I learned some things in areas with which I am not familiar. Others may find it informative to browse through the book in the spirit of inspecting an anthology. But I cannot recommend

Herbert F. Wang Is with the Department of Geology and Geophysics, University of Wisconsin, Madison, Wisconsin.

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RESEARCH MINERALOGIST

The Department of Mineral Sciences at the American Museum of Natural History is reopening its search for a tenure-track position for ASSISTANT CURATOR OF MINERALOGY beginning July 1982.

This is a research position with an average of 1/4 time responsibility towards departmental activities, collections management, exhibition, and interaction with the mineral community at large. High quality problem-oriented research is the prime responsibility. The field of specialization within the mineral sciences is open, and may include and combine aspects of X-ray crystallography, ultrastructure analysis, crystal growth, spectroscopy, gemology, petrologic mineralogy, mineral geochemistry, crystal and thermochemistry. medical mineralogy, and mineral physics. Major research facilities ide a fully automated ARL-SEMQ electron microprobe, X-ray laboratory, minicomputers, and a 100,000 specimen mineral collection. Opportunities exist for research and/or teaching collaboration with nearby Institutions such as Columbia (Lamont-Doherty Geological Observatory), Princeton, SUNY at Story Brook, Yale and Mt. Sinal School of Medicine (TEM facilities).

Requirements are a Ph.D. in hand by time of appointment, an ability to do creative research, and a desire to learn about collections and relate to the public in terms of exhibition and speaking. Applications should include: (1) curriculum vitae, (2) names of three persons familiar with your work who will write letters of recommendation, and (3) a brief statement of research interests.

These must be submitted by February 1, 1982 to: Dr. Martin Prinz Chairman, Department of Mineral Sciences

American Museum of Natural History

Central Park West at 79th Street New York, New York 10024 An equal opportunity (M/F/H) altimative action employer.

Engineering Geologist/Geophysicist.
The Department of Geological Sciences, University of Saskalchewan, has a vacant tenurable posttion in engineering geology/geophysics. Applicants should be qualified to teach undergraduate and graduate courses and to conduct research in engi neering geology. A background in atructural geology may be appropriate. Well-equipped facilities ar lable for research in rock mechanics, fluid flow through porous media, acoustic, and electrical properties of rocks, and permatrost. Good opportu nities exist for joint research with qualifications and experience. Sond applications, detailed personal ees, and other supporting data to Dr. W.Q.E. Caldwell, Head, Department of Geological Sciences, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0.

Please note: until November 15, 1981 consider ation will be given only to applicants who are Canadians or landed immigrants, after that date all applications will be considered

Virginia Polytechnic Institute and State University: Senior Research Associate. Interesting and abundant research and publishing opportunities, including new University-owned MDS-10 VIBROSEIS system, VAX 11/780 computer. Must have experience in theory and application of reflection seismology, and be interested in the application of reflection seismology to the solution of

Send resumes to. Dr. D. R. Wones, Department of Geological Sciences, Virginia Polytochnic Insti-tute and State University, Blacksburg, VA 24061-

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instrumental Analyst/Staff Research Associate III. Job # 61-08-23. Oversee computerautomated wave-length dispersive XRF spectrometer. Minimum qualifications: two years analytica experience or equivalent academic background, preferably but not necessarily with XRFC or NOVA computer. Outles include; maintenance and repair of equipment; software development in FORTRAN for on-line minicomputer; participation in design and execution of stratogies for analyzing trace metals in geological materials, and instruction of users. After first year, opportunity exists for personal research as time permits. Applicants should list equipment and applications with which they're experienced, and responsibilities therewith Salary \$1755 month Apply to Personnel Office, University of California Santa Cruz, 1156 High Street, Santa Cruz, Ca. 95064 no later than November 1, 1981.

Faculty Positions Space Physics and Astronomy Rice University

The Department of Space Physics and Astronomy of Rice University has two regular faculty openings, beginning in academic year 1982–83.

For one position, which is at the professorial level, preference will be given to experimentalists who are Principa Investigators for experiments on present or planned spacecraft missions. However, consideration will be given to other qualified candidates in the general areas of space physics and at-

For the other position, which is at the will be given to candidates with experience in space astronomy, although ap plications are solicited from specialists n any area of modern astrophysical research. It is also desirable, though not essential, that the candidate's research interests complement one or more areas of present astronomical re search at Rice, such as planetary studtes, stellar evolution and nucleosynthe sis, gaseous nebulae, imaging and spectroscopy of galaxies, and computer image processing.

Applicants should send resumés and bibliographies to:

Professor A. J. Dessler (OO) Department of Space Physics and Astronomy Rice University P.O. Box 1892 Houston, Texas 77001

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Petrologist-Economic Mineralogist/Unive sity of Okinhome. Applications are invited for a tonuro-track position, effective September 1, 1982 at the assistant professor level, in petrology and economic mineralogy. The successful appl expected to teach graduate courses in his/her spe cially, to help teach undergraduate courses in mil eralogy-optica-petrography, and to pursue an active esearch program. Consulting and interacting with

mining companies are encouraged.

The University of Oklahoma has made a major commitment to diversity the program in the School of Geology & Geophysics. As a result live tenureons are open for the Iall of 1982. Six new faculty were added to the School in the fall of 1981 (bringing the total full-time faculty to 15), and an additional six positions will be available during 1983-1985. A new building that will house the School is in the design stage, and the succession applicant will participate in equipping it.

The Ph.O. degree is required for this position Preference will be given to petrologists with a strong chamistry background and with a demo strated interest in the economic geology of metalliand non-metallic mineral deposits. Qualified applicanta should arrange to send transcripts of all college and university work, resume, statement of re arch interests, and three letters of reference to: Dr. Maryellen Cameron, School of Geology and Geophysics, University of Oklahoma, Norman, Oklahome, 73019. Deadline for applications is De-cember 31, 1981. Faculty members from the School will be interviewing at the November G.S.A. meeting in Cincinnati, Ohio, and at the December A.G.U. meeting in San Francisco, California.

nate on the basis of race, or sex, and is an equal

Purdue University. The Department of Geosciences invites applications for a faculty position, starting January or July 1982, in the broad field of minoratogy-petrology-geochemistry. A Ph.D. is re-quired and preference may be given to scientists with an established record of research. The Department has an automated electron microprobe, mass spectrometer and laboratory for stable isotope studres, full range of high temperature and high pres-sure equipment, including furnaces for controlled fO₂ experiments, as well as X-ray equipment. The successful applicant will be expected to participal in both the undergraduate teaching and graduate studies programs, as well as actively engage in re-search. Rank and salary are open but will be com-

Purdue University is a land grant, state supported institution committed to academic excellence, and is an equal opportunity/equal access employe For further information please contact Dr. Henry O. A. Meyer, Dept. of Geosciences, Purdue Unive Bity, West Lafayette, IN 47907 (Tel. 317-494-3271). Closing date for applications is November 10

Seismologist. Applications are invited for a posigraduale research position in seismology at the Scripps Institution of Oceanography. Applicants specializing in all areas of seismology will be considered, although preference will be given to recent graduates interested in selsmic wave propagation. particularly as applied to the oceanic enand digital aignal processing. The position has a duration of one year, with the possibility of extension to two years, and an annual stipend of \$18,960. Please send resume and three reference to either Dr. Thomas H. Jordan or Dr. John Orcut, A-015, Geological Research Division, Scripps Insti-tution of Oceanography, La Jolla, CA 92093, prior to 1 December 1981.

Scripps institution of Oceanography, University of California, San Diego is an affirmative action/equal opportunity employer.

Faculty Positions: The University of lows. The Department of Physics and Astronomy anticipates one or two openings for tenure-track faculty in August 1982. One or more visiting professorships, at any rank, are also expected to be available. Preference will be given to candidates with research activity in the following experimental and theoretical areas: astronomy, astron atomic physics, condensed matter physics, elemen-tary particle physics, nuclear physics, plasma phys-ics, and space physics. The positions involve undergraduate and graduate teaching, guidance of research students, and personal research interes persons should send a résumé, a statement of rearch interests, and the names of three professignal references to Search Committee, Department of Physics and Astronomy. The University of Iowa, Iowa City, IA 52242.

The University of lowe is an equal opportunity/affirmative action employer.

Atmospheric Scientist/Oceanographer Po-sition: The Joint Institute for the Study of the Atmosphere and Ocean, University of Washington. Almospheric scientist/oceanogra-pher needed to undertake analysis of interarrual and interdecadat climate-related fluctuations in the ocean and almosphere as revealed by marine surface observations from ships of opportunity and is-

land stations.

Applicants should show evidence of published work on related topics and be adept at eliciting dynamical properties from the analysis of large data

The position is offered through the Joint Institute for the Study of the Atmosphere and Ocean, a co-operative lessearch institute between the University of Washington and the National Oceanic and Almospheric Administration. The work will be carried out to confunction with adentical of the University and

spheric Administration. The work will be carried out in conjunction with scientists at the University and at the NOAA Pacific Marine Environmental Laboratory, which is housed on the University campus. Appointment is for one year, with a possibility of renewal for subsequent years up to a three-year term. Salary is negotiable, depending on qualifications and experience.

To spoly or request further information, write to Director, J.I.S.A.O., Department of Atmospheric Sciences, AK-40, University of Washington, Seette, WA 98195 U.S.A. Applications should include resume, bibliography, and two letters of recommendation. Closing date November 15, 1981.

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The Caswell Silver Distinguished Professorship in Geology THE UNIVERSITY OF NEW MEXICO

The Department of Geology of the University of New Mexico is pleased to invite nominations or applications for the Caswell Silver Distin-guished Professorship in Geology. This endowed professorship shall be warded for periods of up to two years to earth acientists of distinuished accomplishment and international reputation. The professorship may be held by scientists of all specialties of the earth sciences in the broadest sense, and the major criterion for selection is that the inlividual be an active, productive leader in his or her field of research. The recipient must carry out a vigorous research program while in real dence at UNM. The recipient is expected to interact with the faculty and students of the Department and to provide one or more seminars, in an advanced topic of his/her choice, during each academic year. The Foundation will provide unusually advantageous remuneration commensurate with the distinguished nature of the appointment. In addition, a generous allocation for travel and operating expenses (to include secretarial support, analytical services in department laboratories, use of field ehicles, and preparation of manuscripts) will be provided.

Applications or nominations should include a detailed resume and brief statement of major research accomplishments. Applications or nominations should be forwarded to:

Rodney C. Ewing, Chairman University of New Mexico Albuquerque, New Mexico 87131



The deadline for applications is January 1, 1982. The Caswell Sliver Foundation is an equal opportunity employer

Geephysical Fluid Dynamicist/Physical Oceanographer. Applications are solicited for a junior faculty position in ocean physics or dynamics to begin in the academic year 1982-83. Areas of interest to the Department Include analy merical and laboratory modeling of physical proc sses and phenomena in the sea.

Yale University is an equal opportunity/affirmative action employer and encourages women and mem-bers of minority groups to compete for this position Curriculum vitae, publications, and the names of three or more referees should be sent by 31 December 1981 to: Robert B. Gordon, Chairman, D partment of Geology and Geophysics, P.O. Box 6866, New Haven, CT 06511.

aternary Sedimentation and Tectonics or Geophysics. The Geology Department at Miami University invites applicants for a position in either the field of Quaternary sedimentation (including glacial deposits) and tectonics or the field of geophysics. This position is to be filled at the Assistant Professor level beginning in August, 1982. The successful candidate will teach both undergraduate and graduate courses, must possess the Ph.D. degree and have documented ongoing research to be considered for the tenure track posi-

Quaternary Sedimentation and Tectonics. Ideally applicants should have research and teaching interesis in: (1) basin development and recent tectonics; (2) Quaternary sediment transport and depositional processes including till deposition; and (3) geomor-

Geophysics. Applicants should have research

and teaching interests in: (1) relations between

crustal structure and basin and continental margin evolution; or (2) general geophysics to include ar eas from among seismology, geomagnetism, gravi-ty, electrical or heat-flow studies. Visiting Assistant Professorship in Geology. The Department also invites applicants for a visiting assistant professor position beginning in August 1982. The position is of 1 to 3 year duration and is nontenure track. The successful candidate must have the Ph.D. and will be responsible for teaching introductory-level courses as well as leaching and study in the person's area of research interest. This area is unspecified. The successful applicant will be chosen on the basis of qualifica-tions and ability to interact with researchers cur-

rently on the staff. plicants should send a resumé, transcripts three (3) letters of reference and an outline of

leaching and research interests to: Dr. A. Dwight Baldwin, Jr., Chair, Geology Department, Miami University, Oxford, Ohio 45056.

City University of New York, (Brooklyn College): Faculty Positions. The Department of Geology anticipates filling several tenure track positions at Full Professor level. (Salary range up to \$43,400). Highly qualified individuals will b considered for distinguished appointments at an additional \$5,000.

While candidates who have distinguished them selves in any field are welcome to contact us, we are particularly interested in openings in: energy re sources (coal/petroleum), exploration geople wironmental geology or hydrogeology, coastal sedimentology, economic geology. Successful applicants will be required to institute

an active research program, supervise Master's and Ph.D. theses. Nominations and applications with current vitee should be sent to: Dr. S. Bhattacharli, Chairman, Dept. of Geology, Brooklyn College of City University of New York, Brooklyn, New York 11210. Positions open until filled. Brooklyn College, CUNY, is an affirmative action

Faculty Positions. Arizona State University. Department of Geology. Applications are invited for two tenure-track faculty positions, one at the assistance. ant professor level and one at the associate level, beginning in August of 1982. One of these positions requires a candidate with interests in applying modern solid state science to geological phenomena. The selected candidate should develop an active research program and may use the extensive opportunities offered by the Facility for High Reso lution Electron Microscopy at ASU. Teaching duties will include undergraduate mineralogy. Candidates for the other position should complement and extend existing strengths in the department. Possible areas include low temperature geochemistry, heav isotope geochemistry, solid earth geophysics, tectonophysics, and related fields. The ability to use modern techniques in both field and laboratory studies and to integrate diverse approaches is highly desirable. Please send a detailed statement of research and teaching interests and a resume with names of four references to David Krinsley. Department of Geology, Arizona State University.
Tempe, AZ 85287, by January 15, 1982.
Arizona State University is an equal opportunity/
affirmative action employer.

Geophysics University of Colorado

The Department of Physics, University of Colorado at Boulder, and the Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorad NOA ty of Colorado/NOAA are currently recruiting for a tenure track faculty member, in the Department of Physics, with simultaneous appointment as a Fellow of CIRES, who will complement the Department's active role in the University's Interdepartmental Graduate Program in Geophysics. We are particularly (but not exclusively) seeking persons with experience and interest in the areas of space geodesy, geodynamics, or related areas of theoretical geo-

Appointment will be at the level of assistant professor (minimum salary: \$20,000 per academic year) and is expected to start in the fall of 1982. The appointment entails full participation in the Department's undergraduate and graduate teaching programs (including offerings in the appointee's specialty), supervision of graduate students in appropriate areas, and the development of an active research program.

Candidates should send a letter of interest, a current curriculum vitae, and have three letters of reference sent no later than 1 January 1982 to: Chairman

Department of Physics Campus Box 390 University of Colorado The University of Colorado is an affirmative action/equal oppo Boulder, Colorado 80309.

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STUDENT OPPORTUNITIES

craduate Research Assistantehips in Physical Oceanography. Opportunities for gadusts study with Research assistantship available for students interested in M.S. or Ph.D. progams. A summer program with stipend is open to offee juniors. Write: Dougles Caldwell, School of (canography, Oregon State University, Corvallis, 08 97331 Earth Sciences Assistantships and Fellowships. Research assistantships and fellowships are available to graduate students in the earth sciences from the Columbia University Department of leological Sciences. The awards cover tultion and ises, and provide a yearly alipend of between \$6400 and \$8180.

Research is carried out at affiliated institutions including the Lamont-Doherty Geological Observatory, the Goddard Institute for Space Studies, and the American Museum of Natural Hietory. Research topics available to students reliect the interests of the more than 300 Ph.D.-level scientists at these etitutions and apan virtually every area of the earth eclences.

The department encourages applications from students with an undergraduate degree in any of the natural sciences or engineering. For additional information please contact Ms. Mis. Leo, Department of Geological Sciences, Columbia University, Lamont-Doherty Geological Observatory, Patsades, New York, 10954.

Graduate Teaching & Research Assistantships/University of Houston. Graduate teaching & research assistantships available to qualified persons interested in Space Physics at the University of Houston Our experimental program features rocket & balloon-borne studies of the ionosphere & magnetosphere-lonosphere coupling Emphasis has been on active experiments, most recent being a rocket-balloon campaign at Siple station, Antarctica in December 1980. Future work includes a study of pulsating aurora & participation in Walehole II, an auroral quenching experiment.

The theoretical program is on plasma waves in the solar wind & modeling of phenomena related to current experiments. Assistantships for first year students begin at \$600/mo along with out of state tuition waivers. Graduate Chairman, Physics Dept. University of Houston Central Campus, Houston,

COURSES

Course No. 450: Clouds: Their Formation, Properties and Effects, Pasadena, CA. NOV 30-DEC 4, 1981. The course is designed to provide a basic understanding of the concepts and an everylew of the dynamical and micro-physical processes involved in the formation of air pollution. The results of recent studies of clouds on other planets will also be discussed. The course is especially structured to benefit those scientists whose main area of expertise is not in clouds but who wish to be brought abreast of current studies in this subject. Instructors will be Drs. P. Hobbs, C. Leovy, H. D. Orville, B. Scott, T.Vonder Haar, and E. J. Zipser. Registration fee is \$590. A Certificate of Course Completion will be swarded to those who complete the course. For

urther information contact Diana McQuest Course Coordinator, IFAORS, P.O. Box P. Hampton, Virginia 23666 (Tel: 804/827-581)

AGU

 A new journal, Volcanology and Seismology, is now being published by the U.S.S.R. Academy of Sciences. \$ A Fedotov is the editor. AGU was approached as a possible publisher of a selected English translation of the journal, which was to be sold by subscription. There was not enough interest to proceed, and the translation rights are no longer available to AGU. To serve the needs of the secton better, please let us know what Soviet journals should to considered for translation. Please notify Joseph V. Smith, Department of Geophysics and Science, University M Chicago, Chicago, IL 60637 (telephone: 312-753-8110). In particular, please state whether your library would buy

• Andrew F. Nagy (Department of Atmosphere and Ocean Sciences, 2455 Hayward, University of Michigan, And Arbor, MI 48109 (telephone: 313-763-5536) is soliciting review articles for Reviews of Geophysics and Space Physics. VGP members are urged to contact Nagy If they have ideas for sultable papers.

 VGP members who attend the AGU Fall Meeting in San Francisco will want to attend the joint Planetology VGP luncheon on Thursday, December 10, at the Nikko Restauand The luncheon in Baltimore was very enjoyable, and his one will feature the added attraction of providing the opportunity to meet informally with members of the section

> Brent Dairymple Secretary, VGP

Hydrology Prepares to Select Fellows

According to the recent AGU Council ruling, the Hydrology Section's Fellows Nominating Committee soon will select three hydrologists from those nominated by section members for the honor of AGU Fellow. The names of the three selected will be forwarded to the chairman of the AGU Fellows Committee for their annual selection of approximately 11 Fellows.

The Hydrology Section's committee is composed of Leonard F. Konikow, Ignacio Rodriguez-Iturbe, Mark F. Meler, and Jaimie Amorocho. Peter Eagleson, section president-elect, serves as committee chairman; Jim Wallis, president of the Hydrology Section, is an ex-officio commit-

Travel Grants to IAG General Meeting

Deadline for Applications: January 1, 1982 AGU has applied to the National Science Foundation for a grant to assist the travel of individual U.S. scientists to the General Meeting of the International Association of Geodesy, to be held in Tokyo, Japan, May 7-20, 1982. Application forms for the grants are available from Member Programs Division, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009 (telephone 202-462-6903 or toll free 800-424-2488).

Nominations for Medals and Awards —

William Bowle Medal. Awarded for outstanding contributions to fundamental geophysics and for unselfish cooperation in research.

Maurice Ewing Medal. Honors an Individual who has led the way in understanding the physical, geophysical, and geological processes in the ocean; ocean engineering, technology, and instrumentation; or who has given distinguished service to the marine

James B. Macelwane Awards. Up to three awards are presented each year for significant contributions to the geophysical sciences by a young scientist of outstanding ability. Recipients must be less than 36 years old.

Robert E. Horton Medal. Awarded for outstanding contributions to the geophysical aspects of hy-

Letters of nomination outlining significant contributions and curriculum vitae should be sent directly to the appropriate committee chairmen: Bowie Modal-George D. Garland, Department of Geophysics, University of Toronto, Toronto 5, Ontario, Canada, Ewing Medal—Robert O. Reid, Department of Oceanography, Texas A & M University, College Station, TX 77843; Macelwane Award—Manik Talwani, Lamont-Doherty Geological Observatory, Palisades, NY 10964; Horton Medal-Peter S. Eagleson, Department of Civil Engineering, Building 48-335, Massachusetts Institute of Technology, Cambridge, MA

> **DEADLINE FOR NOMINATIONS IS** DECEMBER 15, 1981

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- Workshops on electromagnetic and seismic methodologies, where participants will have the opportunity to discuss their problems and their research.
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Here is a conference that provides time for participants to TUCSON Marriott

engage in informal discussions about their work. The program committee will encourage the organization of some informal workshops involving speakers and registrants, in addition to

invited speakers:

Peter Annan, Golder Associates

Robert W. Bartlett, Anaconda Copper Company

Norman I. Bielstein, Department of Mathematics, University of Denver Alberto P. Calderon, Department of Mathematics, University of Chicago

Michel David, Mineral Exploration Research Institute James G. Glimm, Department of Mathematics, Rockefeller University

Phillip Grote, Science Applications, Inc. Gerald W. Hohmann, Department of Geology and Physics, University of Utah

Kenneth L. Larner, Western Geophysical Co. Thomas R. LaFehr, Exploration Data Consultants Incorporated Richard B. McCammon, United States Department of the Interior K. G. McCracken, institute of Earth Resources Misac N. Nabighian, Newmont Exploration Limited Enders A. Robinson, Department of Geological Sciences, Cornell University Robert H. Stolf, Conoco, Inc. Ted Way, In-situ Consulting, Inc.

Jim Kosolas, International Submarine Technology, Lld.

Advance Registration

To obtain a copy of the program, advance registration material and hotel reservation card, contact SIAM, 117 South 17th Street, Philadelphia, PA 19103, Telephia 19103. Telephone: (215) 564-2929.

The symposia for this conference is being supported by the National Science Foundation.

J,

Meetings

Remote Sensing Symposium

A call for papers has been issued for the symposium on Remote Sensing and Mineral Exploration, scheduled for May 17-22, 1982, in Ottawa, Onl. The symposium will include a session on the use of geophysical data with remotely sensed imagery in the exploration of petroleum and mineral deposits and groundwater. Emphasis during the session will be on global terrestrial data sets, geophysical satellite systems and data, manual and digital synthesis of spaceborne remotely sensed imagery with geophysical data in geological exploration, and case histories. Session chairman is David A. Hastings at the Applications Branch of the EROS Data Center, Sioux Falls, SD 57198 (telephone: 805/594-6114),

Other sessions on the agenda include spectral measurements of rocks and alteration zones; temporal aspects of mineral resources discovery; continental and global models; North American Plate mosaic and lineament map; and future plans for research and information exchange.

Deadline for submission of abstracts to the symposium chairman is January 15. For additional information, contact W. D. Carter, Symposium Chairman, EROS Office, U.S. Geological Survey, MS 730, Reston, VA 22092.

The symposium is sponsored by the Committee on Space Research (COSPAR) of the International Committee of Scientific Unions, the International Union of Geological Sciences, the Association of Geoscientists for International Development, and the International Association of the Genesis of Ore Deposits. XX

Symposium on Urban Groundwater

A half-day symposium on groundwater in the urban environment will be held as part of the American Geophysical Union's Spring Meeting in Philadelphia on May 31 to June 4, 1982. The symposium is cosponsored by the Groundwater Committee and the Urban Hydrology Committee.

In recent years, much attention has been lavished on surface water in the urban environment, but very little has been published on groundwater considerations specific to urban areas or on the effects of urbanization on groundwater quantity and chemistry. The purpose of this symposium is to highlight current work in this area. Papers are now being solicited for inclusion in the symposium. Topics include, but are not restricted to, the following general areas: methods and effects of dewatering; alterations in groundwater chemistry as a result of waste disposal, spifls, and leaks; effects of urbanization on natural groundwater recharge and discharge; and flooding of foundations as a result of rising water levels. The symposium will focus on case studies and applications of models.

Abstracts should be prepared according to AGU format and mailed before February 15, to Mary P. Anderson, Dept. of Geology and Geophysics, University of Wisconsin, 1215 W. Dayton St., Madison, WI 53706. In addition, the abstract original must be sent to Meetings, AGU, 2000 Florida Ave., N.W., Washington, D. C. 20009 by the Spring Meeting abstract deadline in early March. Additional Information can be obtained by calling Anderson (608-262-2396) or J. W. Delleur (317-494-2172). 2

New Techniques to Probe Atmosphere

A symposium entitled 'Radio Probing of the High-Latitude Ignosphere and Atmosphere: New Techniques and New Results' will be held at the Geophysical Institute at the University of Alaska in Fairbanks on August 9-13, 1982. The symposium is sponsored by Commission G of the International Union of Radio Science (URSI). Robert D. Hunsucker is the steering committee chairman.

Scientists interested in submitting papers for presentation at the symposium should contact the technical program committee chairman, Ray A. Greenwald, The Johns Hopkins University, Applied Physics Laboratory, Johns Hopkins Road, Laurel, MD 20707. Information on conference registration can be obtained from the conference coordinator. Patricia Brooks, Geophysical Institute, University of Alaska, 903 Koyukuk Avenue North, Fairbanks, AK 99701. The meeting is limited to 100 participants. 88

Superior Geology

The 28th Annual Meeting of the Institute on Lake Superior Geology will be held in international Falls, Minn., May 5-

The focus of the meeting will be on Archean geology of the Minnesota-Ontarlo border area.

One-day field trips to Archean areas near international Falls and Fort Frances, Ont., are planned for May 5 and 8; technical sessions are scheduled for May 6 and 7.

For additional information, contact David L. Southwick, Minnesota Geological Survey, 1633 Eustis St., St. Paul, MN 55108 (telephone: 612-373-3372). 88

AGU Congressional Science Fellowship

The individual selected will spend a year on the staff of a congressional committee or a House or Senate member, advising on a wide range of scientific issues as they pertain to public policy questions.

Prospective applicants should have a broad background in science, be articulate, literate, flexible, and able to work well with people from diverse professional backgrounds. Prior experience in public policy is not necessary, although such experience and/or a demonstrable interest in applying science to the solution of public problems is desirable.

The fellowship carries with it a stipend of up to \$25,000 plus travel allowances.

Interested candidates should submit a letter of intent, a curriculum vitae; and three letters of recommendation to AGU. For further details, write Member Programs DIvision, Congressional Fellowship Program, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

Deadline: March 31, 1982.

AGU CHAPMAN CONFERENCE

RAINFALL RATES

Sessions planned:

Atmospheric physics as related to rainfall process.

Applications: point, area, quasihorizontal path, sur-

Call for papers published in EOS, July 14. Abstract

The complete Geophysical Year last appeared in the August 25 Boldface type indicates meetings sponsored or cosponsored by

August 23-27 Ninth Annual Meeting of the European Geophysical Society, previous listing of date of meeting was incorrect. Additionally, it should be noted that this meeting is run in conjunction with the 18th General Assembly of the European Seismological Commission.

New Listings

January 26-29 Fourth Annual Conference on the NASA Geodynamics Program, Greenbelt, Md. (P. T. Taylor, Code 922, NASA/Goddard Space Flight Center, Greenbelt, MD 20771.)

ation for the Advancement of Science, Pacific Division. Santa Barbara, Calif. Sponsors, American Meleorological Society, Atmospheric and Hydrospheric Sciences Section of AAAS, Pacific Division. (Á. E. Leviton, Executive Director, AAAS (Pacific Division), California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118.) August 28-31 Alfred-Wegener-Conference on Geophysical, Geochemical and Petrological Evidence on Deformation and Composition of the Continental Subcrustal Lithosphere, Seehelm, Federal Republic of Germany. (K. Fuchs, Geophysical Institute University, Hertzstr. 16, D. 7500 Karlsruhe, Federal Republic of Germany.)

April 27-29, 1982 Urbana, Illinois

Convenor: D. M. Hershfield

Measurement: mass (tipping bucket), photoelectric. magnetic, and remote methods. Models: physical, mathematical, and statistical. face, troposphere, and stratosphere.

deadline: December 21, 1981.

Changes

June 20-25 63rd Annual Meeting of the American Associ-

GAP

Exploration Geophysics

Only Computer applications a purpose to related the purpose of the accountry to the second price of the accountry of the acco nymother invandance, present in the opening with the unit fields. Both earth structure and a variable background velocity can be accounted for by mobining the Bira and WEBI appearimations, is a "before orack" nigration with two output sections, one for

decaits variations and the other for built modulus estantions.

For the inversion, the major is considered to be

For the Investion, the medical is considered to be a considered of a breast low-negatial frequency variation from harbyr being marked by the property variation in this mobiles and density (the policy obtains) the deliminations of the beinground of the content of the content of the content.

If a content Parkyton of years the frequency content of the content.

If a content Parkyton of years the frequency of the Appointment of the content of the content of the property of the Appointment of the third in the series, computations are 3 on in the Eugentum of years the first part of the Appointment of

forth.
The mathed registed multiples and durinte waves and it is restricted to precritical reflections. ite . to distinguishable from bull modulut only

OSIO Mannette and electrical methods LANGIST ESTIMATION AND DECEMBRICAL COLUMN D. W. Chimburg (Department of Geophysics and Astronomy, University of Statish Columbia, Yantou-

Three methods have been presented for continued and a second pareliate of the religious either a locatight poor; trate inverse filter for the source wavelet. An approximate reflectivity sequence might be derived: son a velocity leg at, or near, the site where

minimum entropy deconvolution (MED). The approxi-bace fiveres filter for the source vavelet is pro-vided by MED. All sethods performed well when test-ed on data generated from wavelets of different character, and this provides optimise that these methods with work satisfactorily in a variety of geophysical problems where the data set the convol-ution of a seatch wavelet end a "spikey" model. The deconvolution troblem discussed here is non-unique, and satisfactory wavelet constructions re-quire that some subjectivity be introduced by the investigator. Even so, we present one example where the computed wavelet and reflectivity sequen-ce, both of which appear geophysically reasonable, differed significantly from the "true" for ctions. This example tilusates the numeriqueness interest This example liberates the minuniqueness interest in this probles and theus the importance of additional constraints on the deconvolution results.

ONE Magnetic and electrical rambods EFFC/REMACHETIC ACTIFF SHURCE SOUNDING NEAR THE EAST PACEFF THE PERSONNEL SECTION OF Institution of Calcumpagns, Processing of Calcump at San Degre, La Jolla, Cardonna (1991)

a materiary 2003). An active with electrical conductivity wounding was carried out rear the first Paulic River at 21th. The average electron conductivity from 2 hm beneath the seafour into the upres minute was first to be about 0.000 M/m there is no exclaime of fully two-term majors at a distance of 7 hm from the spreading about the integral conductivity with depth of the crucal took at the integral conductivity with depth of the crucal conductivity.

Sea, ben. Reit latte, Paper 2112do

0920 Magnetic and electrical methods YEST LOW-TREQUENCY ELECTROMARKETYC INTREPRETATION USING THE ANGLE AND ELLIPTICITY MEASUREMENTS A. Sacit Saydon (Obel) Canada Respectes Ltd., P.O. Box 100, Station M. Colgary, Alta., Canada TD

Suring this study, a plane-wave computer modeling approach was used to gets edge insight into the trespone of wartical abest conductors at very low-frequency (VLF). The median which marrounds the requese or were can asset conductors at wary low-frequency (THF). The medium which mutrous the conductors is assessed to be a dissipative one. Mag-hiaude and shape of the annualbum field count by a vertical "this" conductor at VIF is found by a spanners mainly on (1) conductivity-thickness pre-size of annualbum (2) registrive of hous medium. (1) depth to the top of conductor, and (4) overly-ing conductive averbardes, Other veriables being the same, a shife in frequency in the 17 to 15 kbs rance does not produce an approclable change in the neural response of moderal conductory. The lateral distance between the sections, and winisms on a till caple, profile is related to productivity and thickness of conductor, requestively of the heaf rock, and depth on the top of the productor in a complex servar.

An interpretation behave the been proposed to determine the conductivity-thickness product and dapth of vartical sheet conductors from cilt angle and ellipticity measurements at VLF. Rasincivity of the host medium had to be incorporated in the achers due to strong dependence of response on this parameter. Five characteristic diagrams have been constructed corresponding to host rock restativities of 10, 230, 800, 2500, and 8000 from, which cover the most cormonly encountered resistivities in the field. Conductivity-thickness product for; 2) and depth (D) of conductor can be read directivities the appropriate diagram when mask-to-pessitil angle and elipticity values are entored. CEOPHYSICS, VOL. 46, 50, 11

0910 Magnetic and electrical methods MAGNETITE MAPPING UTS A MULTICOIL ATRIORNS ELECTROMAGNETIC SYSTEM Douglas C. Franker (Dighes Limited, P.O. Box

First Canadian Place, Sta. 7010, Torosto, Ont., Canada MSX 107)
The information contest of data from an in-phase quadrature slactromagnetic (DM) system consists of a combinations of conductive eddy current response and majnetic polarization response. The secondary field resulting from conductive addy current flow is frequency-dependent and consists of both in-phase and quadrature components of positive aign. Conversely, the field resulting from magnetic polarization is commonly frequency-independent and consists of only an in-phase component of negative sign.

A rappetite mapping technique.

consists of only as in-phase component of negative sign.

A respectite mapping technique was developed for the harisontal coplanar coils of a closely coupled multicoil althorne Bu system. The technique yields contours of apparent weight percent mapped the when using a homeogeneous half-space model. The mathod can be rosplementary to magnetomest mapping in certain cases. Compared to magnetometry, it is far less manistive but is more able to resolve closely spaced esquelite somes. The method is also independent of remannet magnetism and magnetic latitude. This mentium to .25 percent magnetic by whight when the sensor is at a height of 30 m above a mignetic latitic half-space. It can individually resolve are separeted by 60 m. re separated by 60 m. FOTHYSICS, WOL. 46, 80, 11

OGIO Magnetic and electrical methods
INTERPRITATION OF HACKTIC ANGRALIES DUE TO DIRES!
THE COMPLEX GRADIENT RETHOD
D. Alchate Reo (Malloral Geophysical Research
lustique, Uppal Road, Endershand 500 007. India)
H.V. Ram Erbu, and Y.V. Sanher Marayan
A method to interprat the magnetic andmerly due
to a diplois dike using the resultant of the horicontail and vertical gradients of the density is
a vertical and vertical gradients of the density is
a vertical for maniferial for the horicontail and vertical gradients of the density is
a vertical and vertical gradients of the density is
a vertical and vertical gradients of the density is
a vertical and vertical gradients of the density is
a vertical and vertical gradients of the density of the
interpretation of the density of the gradient of the
dire. For a dide uniformly magnetized in the sample is
adjusted fields, the majirude glot is interpretable.

of 0, the Index paramutar, which depends upon the strike and dip of the dike and the magnetic inclination of the area. The phase of the complex gradient is an antisymmetric curve with an offset value squal to -0, to a dike whose half-width is greater then its depth of burial, two manima at equal distances on either side of a minimum value appear on the amplitude plot. For a dish whose half-width is equal to or less than its depth of burial, the amplitude plot is a bell-abaped symmetric curve with (to maximum appearing directly over the origin in the case of a thin dike, the amplitude function fells off to half its maximum value at the same point on the abscings where the phase function reaches, i.e., -(g_t, **/2). A combined analysis of the amplitude and phase plots of the complex gradient yields all the pursuesters of the dike. The methad is applicable for the segmentic annealy in a either the total, vertical, or horizontal field. either the rotal, vertical, or horizontal rase. A field szample is included to show the applicabil-ity of the method, GEOPHYSICS, VOL. 46, NO. 11

as well as producing gross assorting of irragular refractor copagaphy.

The dapth conversion factor is relatively insensitive to dip angles up to shout 20 degrees, berative to dip angles up to shout 20 degrees, berative to dip angles up to shout 20 degrees, berative to dip angles up to shout 20 degrees, berative to dip angles up to shout 20 degrees, berative to dip angles to should be a reason to an undulating refractor are particularly convenient even when the countries greatestar.

The day provides a means of recognizing and seconscatting understand layers, provided as options XY value can be recovered from the traveltime data the refractor velocity analysis, and/or the limit of presents of undetected layers can be depthe. The presents of undetected layers can be accomplished to the calculated from the compited depth spotion. The undetected layers can be accomplished by uniting an average velocity permits appring the depth calculations with commonly amountered typically (vonctable). This average velocity permits accomplished depth; calculations with commonly amountered typically (vonctable).

O930 Seismic methods
AN INTRODUCTION TO THE GENERALIZED RECIPEOCAL
METROD OF SEISMIC REFRACTION INTERPRETATION
Deracke Falser (Geological Survey of New South
Males, OFO Sox 5288, Sydney, N.S.W. 2001.
Australia)
The generalized reciprocal method (GNN) is a technique for delineating undulating refractors at any
depth from in-line estantic refraction data consisting of forward and rewerse traveltises.
The traveltises at two geophones, separated by a
variable distance IT, are used in refractor velotity analysis and time-depth calculations. At the
optimum IT specing, the upward traveling segments
of the rays to each geophone emorge from set the
name point on the refractor. This results in the
refractor velocity analysis being the simplest and
the time-depths showing the most detail. In contrast, the conventional reciprocal mathod which
has IT equal to zero is especially provide to prodece upmerous filetitious refractor velocity changes;
as well as producing gross smoothing of irregular
refractor topography.
The destrictions refractor is relatively insens-

MEN Select methods Selected of Attenuation From Vertical Seishic

MANAGEMENT OF ATTENDATION PRODUCTION Research Full 5. Sauge (Formerly Exxon Production Research Go. P.O. Box 2189, Houston, TX 77001; presently Million Petroleum Co., 71-C PRC, Sertlesville, OX Million Petroleum Co., 71-C PRC, Sertlesville, OX

Millips Petroleus Co., 71-C rac, sertiesville, OX 1900)

Yelus of attamation have been extracted from
Yelus of attamation have been extracted from
five detailed velocity surveys. Significant amounts
five detailed velocity surveys. Significant amounts
of attamation wary by a factor of
the mured values of attamation wary by a factor of
10, ranging from less them O.1 to 0.9 dB/wavelength.
Observation of attamation with lithology is good,
considering the resolution limits of the surveys.
Observation of surveys was performed in West Texas,
the of the surveys was performed in West Texas,
and the other four were carried out in the Gulf
Coast area. The total number of recording depths
to the four were carried out in the Gulf
coast area. The total number of recording depths
to each survey warised from 11 to 208, with downhole
totallings taken avery 10 to 20 ft over key stratistable comes. In all five surveys, a monitor geophes was placed near the well to check for source
constitutely.

pleas was present the measuring attenuation involved consistants; for measuring attenuation involved constructing the spectral ratio between each downlast and one particular reference pulse. A wist of consulative attenuation (As) was then existed from each spectral ratio and plotted as a function of geophore depth. This method allowed us your sale was made use made use made use and the second spectral ratio over each depth interval.

0930 Seissic mathods
SETSITE ANTITUDE ANOMALIES ASSOCIATED WITH THICK.
FIRST LOD SAUDSTONE LENSES, EASTERN POMDEF RIVER
1951, MYCHINO
A. B. Baich (U.S. Geological Survey, Sox 25046, MS
580, Denvar Federal Canter, Denvar, CO SO225) M.
V. Les, John J. Hiller, and Robert T. Ryder
Seerel new discovering of oil production in the
les sandstone, and economic unit in the Fenneylvanism siddle smaker of the Minneluss formation, castym Yowler River basin, Mycoming-Nabraska-South
Motola, have renewed exploration interest in this
arms. Vertical seismic profiles (VSP) and model
stells suggested that in measurable seismic sapiltude smorely is frequently associated with the
thirt First lee mandstone lonsen. To tost this concast, a surface reflection seismic profile was run
leves tow wells shout 12 miles spart. The First
lee use present and productive in one well and
the and berren in the other. The surface prefile
that the predicted amplitude annually at the well
with may there in the inner to exist. Two other
lives surface profile between the two wells,
with may indicate the presence of childithous
leves.

ONO Saissic methods

MINION UNCERTAINTY OF INTERVAL VELOCITY ESTIMATES

I. Sajasi (Department of Geological Science,
thurstry of Sankatchewam, Senkatoon, Sask.,
Lands 678 ONO) I. 7. Sereda

The bix equation (Dis., 1995) is commonly used to
estimate interval velocities from stracking velocity
and travelties information. The errors in these
stimates can ramput from a number of factors, incleding indiscriminate substitution of stacking
relatives for root-mean-square (2005) velocities
without companies ing for the affacts of spreadlegth of dipping ralisators.

A first-order error equation has been developed
with estimates the meantwom uncortainty for Distrived interval velocities when the accuracy of
the input real welocity and normal incidence time

three interval velocities when the accuracy of the input raw velocity and normal incidence the idensities is considered. Some simple numerical equium and the calculated interval velocity increased with depth and is inversely proportional to layer thickenses, even when the errors in the input velocity and time veriables remain constant. Coversics, Vol. 46, NO. 11

NIS BELSOTOLOGY (Stretospheric Trace Cases) ADDSHUBIC TRACE GAS MEASUREMENTS WITH A NEW CLARACK SAMPLING SYSTEM

LIM ARR SAMPLING SYSTEM

Lisiter (Environmental Measurements Luboratory,
0.3. Department of Energy, New York, NY (3014),
1. Somers and S. F. Guggenheim

Be development of a new clean air sampling
lytts for the Department of Energy's WB-57F
literaft has allowed the analysis of CCl₂F
(Pherocarbon-11), CCl₂F₈ (Fluorocarbon-12),
UKIN, (Fluorocarbon-22), CgCl₂F₈ (Fluorourbon-11), CR₄, CO, CO₂, NgO, CN₅Cl, CCl₄,
CgCl₅, CS and SF₄ in tropospheric and
literapheric samples. Samples collected during
the latercaption of the plums from the aruption
of Nount St. Melens indicate that CCS was injectal later the stratesphere during the suprison. A

ted late the stratesphere during the cruption. A large CO, gradient was found at 19,2 km on this flight. (Trace gases, atratespheric measure-

IN Hectrical phenomena in HTMLERCE OF COMMAS SPACE CHARGE ON A SIECT RESIDENCE OF ATHOSPHERIC POTENTIAL L. C. Wilhelt (Mayel Essearch Laboratory, Pashington, DC 20375) Esseror introduced into a tethered-hall

**Mongaton, BC 2075)

The arror introduced into a tetherad-ballous
**settlement of the atmosphoric potential by
the plane of space charge drifting downwind
from the conducting tether is somelyzed. A
**settlement of simplifying assumptions yield a
when of simplifying assumptions yield a
when attacked the model capable of
Naring an upper bound on the relative magnitod of this error in terms of the height
**Altered by the helicant.

shired by the balloon. Relaxing the most brent of these assumptions allows more resi-

litic error estimates at the expense of some less of rigor. It is concluded that an alti-

Alghe is sufficient to reduce the error ha-im 10%. (Atmospheric electricity, iono-pheric potential, corons discharge)

iphys. Res., Gress, Paper 101412

13) Electrical phenomena DESC MANUSCREET (ALCOHOLDE LATEURICAL POTENTIAL USING TETEURED BALLOONE 1. C. Willest (Gaval Bannarch Laboratory, Washagton, OC 2013) and W. David Rust has progress toward a direct manuscrement of the complete potential is summarfised. The measurement technique is described and the traits and their implications are discussed to assima slittled and potential statement to assima slittled and potential statement to the same and their implications are discussed to assima slittled and potential statement in the same should be assimated to the same should be sufficiently of the same should be same and the same should be same

J. Caophys. Res., Great, Paper 101413

JIM M.O in the atmosphere
ANNOTASED HICKNAME ORSERVATIONS OF
HICKNAME ORSERVATIONS OF
HITCHARD IN JANUARY, APRIL, JULY, AND
b. L. Thechor (E. O. Halburt Center for Space
feestch, Mars Beneurch Laboratory, Mashington,
1, 2, 2013), C. J. Gibbins, F. K. Schwatts, and
be 6, -3, Levilacque

1. a. avilacque dibbins, F. R. Schwartz, and D. S. Lavilacque dibbins, F. R. Schwartz, and D. S. Schwartz,

iligat. (Trace gener) Mats, afroraft sampling). Gophys. Res. Lett., Paper 11.1316

Mics over each depth intolverses, vol. 11

esco. ROMYSICO, VIII., 46, NO. 11

Meteorology

3735 Interaction of atmosphere with electromagnatic waves
OBSERVATION OF THE LATERAL FLUCTUATION OF THE
LASER BEAM PASSING THROUGH THE ATMOSPHERE
T. Yokol(Yonggo Technical College, Yonggo, Tottori Prefecture, 683 Japan)
Lateral fluctuation of the laser-heam spot formed after quasing through a distance of 2.26 he
above the sea-surface was observed conther with
the air and the surface-water temperatures and
the telective hundrity. Our main phonomenalisticcal findings were as follow. 1) A markens value
of the vertical displacement of the buse spot
and that of the time rate were 7.1 m and 0.5
mean respectively, if the "large fluctuation",
the displacement larger than 10 cm, was likely
to occur just before the sources and nore reserkebly just after the samset. Mil in each run of
observation the frequency of such a "targe fluctuation" seemed to be correlated with the changes in the sir responsiture and relarive bundity
iv) An incresses of the temperature gradient coresponding to the maximus displacement of 2.1 m
was sestimated to be 0.62 deg/m. I Temperature gration, James beas, propagnitum, lateral fluctuntion),
J. Geophys. Res., Gram. Paper ICIA15 J. Gaophyn. Res., Grann, Paper 1C1415

3770 Particles and aerospis CHARACTERIZATION OF TROPOSPHERIC DYSERY AFROSOLS AT BOLAR MAYELENGTHS BY MULTISPECTRAL RADIOMETRY PRON LANDSAY

AT BOLLE WATELENGTHS BY MULTISPECTRAL RADIOMSTRY FROM LEMBAT

J. Ottermen (Tel Aviv University, Rames Aviv. Iereel) R.S. Fraser and O.P. Behethi Characteristics of tropospheric asreols are derived by comparing measurements from Londest over heavy concentrations of desert aereols with data computed from the tadjetive transfer models. Over the ocean madir spectral reflectivities are computed. Over land, the comparison is in terms of the ration of the madir reflectivity of the surpace of the ration of the madir reflectivity of the surpace of the ration of the madir reflectivity of the surpace of the ration of the madir reflectivity of the surpace of the ration of the madir reflectivity of the underlying tertain. This resots among method is found to be a sensitive approach for measuring the imaginary part of the refractive index, b. The desert aerosis under scudy, in the Iran and Pakistam area are essentially pure scatterers; n. of 0.001 i 0.001 is reported for each of the flux Lundest spectral bands, that is for the apactral interval from 0.5 to 1.1 un. Aerosol size distribution and optical thickness are assessed with a low accuracy.

J. Geophys. Res., Green, Papar ICI410

3770 Particles and servetols SIZE DISTRIBUTION OF 210ph ARROSOLS OVER OCEANS J. Sanah (Coutre des Paibles Radioactivités, Laboratoire mixta CNRS-CZA, Avanus de la Terrasse, 91190 - Gil-sur-Yvette, Franco), A. Geodry and

G. Lembert
We have studied the size distribution of 710pb serosols collected by a cascade impactor during a cruise from Marseille (Prence) to Amsterdan Igland (South Indian Ocean). It was shown that 70 to 90% of the activity is measured in particles with a dismater smaller than 1.2 µm either in a continental atmosphere or in open ocean. This result confirms that 210pb is a good cracur for aerosols produced by gas-to-particle conversion.

Geophys. Res. Lett., Paper ILI21

Mineralogy, Petrology, and Crystal Chemistry

4310 Crystal chemistry
COPPER COORDINATION IN LOW CHALCOCITE AND
DIVELEITE AND OTHER COPPER-BICH SULFICES
HOWARD Y. EVANS, Jr., U.S. Geological Survey,
959 Mational Center. Reston. VA 22092
The new structure detarsination of low chalcocite Cu.S. and dyuleits Cu., 25. have provided a large number of constraint on of the
coordination behavior of copper with sulfur in
copper-fich sulfides. Ranges of Cu-S bond
langthe are 2.19 to 2.74 Å in linear CuS,
groups; 2.21 to 2.60 Å in triangular CuS,
groups; 2.21 to 2.90 Å in terrahedral CuS,
groups; 2.23 to 2.90 Å in terrahedral CuS,
groups; 2.23 to 2.90 Å in terrahedral CuS,
groups; 2.24 to 2.60 Å in triangular CuS,
groups; 2.25 to 2.90 Å in terrahedral CuS,
groups; 2.25 to 2.90 Å in terrahedral CuS,
from other copper-fich sulfides, in which the
tetrahedral, triangular and linear Cu-S bond
considerations are requestly show large distortions
and wide verificitions in bond langths.

4210 Crystal Chemistry HETEROGENEOUS MICROSTRUCTURES IN COLITIC CAREC-NATES S.E. Gundarson (Department of Geology and Leo-physics, University of California, Berkeley) and

physics, Universally, And politic carbonates have Several bioclastic and politic carbonates have Several bioclastic and solitic carbonates have been studied with the transition electron microscope. Aragonite has been distinguished from calcite on the basis of the SAD patterns and the morphology. The aragonite occurred either as microscopic crystals varying in length from 0.3 to 1 mm, or as largar masses twinned on (10). The study of the calcite in the lowester Twin Creek Golite (Misconsia) and other limits of the calcite in the lowester twin the TRM has revealed the pressure of a sodulated microstructure in low by deleties. Both course and fine modulations are found to be parallel to (1014) - T. The alcrostructure is similar in appearance and orientation to a structure of the meaning of the passage of 1980) in machant calcian poralisi to (1014) = r. The microstructure is paralisi to (1014) = r. The microstructure found by Beader (1980) in sociant calcian dolomites. He apparent chemical difference was found when comparing calcite crystals that have the microstructure to these that lack it. The modulated microstructure was found to be roteed by a teins formed during deformation and is therefore older. It is suggested that the modu-lated structure is the result of an ordering phase transformation from a calcium carbonate in which the CO₂ groups are disordered, result-ing in the formation of planar faults. Alter-natively, defeats and partial disorder developed during crystal growth. Disorder appears to occur is saccodary calcite crystals, i.e., those which toward by discolution and reprecipitation from sunther capbodate.

4210 Crystal chemistry THE CRYSTAL STRUCTURE OF JAGOITE THE CHYSTAL BYFUCTURE OF JANOITE
M. Mellini (Tet. Mineralogia, via 8. Maria
53 Piea, Italy) and 5. Merlino
The orystal structure of jagoice (a =
8.528, g = 31.33 A) was solved and refined in space group PSJC to R = 0.057.

The structure is characterised by the presence of double and single tetrahedral layers connected by a sheet of iron and

The idealized crystal chemical formula ${\rm vi}_{\rm X_6Pb}{}^{\rm 2+vf}_{12}{\rm N_4}{}^{\rm (Si_4T_6)}{}^{\rm (Pb}{}^{\rm 2+Bi_{16}T_4)0_{76}}{}^{\rm (OH)}{}^{\rm 4^{Cl}6}.$ Possible ordering schemes, in space group Pile, are proposed. Am. Hiseral, 56, July August

4250 Mineral occurrences and deposits.

KARLTER, A NEW BORNTE MINERAL

G. Frans (Institut F. Angelandis Campigalk etc.,
Technische Universität, Straße des 17. Juni 135,
D 1000 Barlin, West-Gensyn) D. Kebschand end
E. Keet

D 1000 Barlin, West-Generally D. Mccarline, a new locate mineral with the ideal ined Marline, a new locate mineral with the ideal ined Marline, Roy, (E); (E); (C); cookey, in a clinchatentive-mineral inequal associated with indeigning at Schlageistal, Sillectaler Alpen, Austria. The Schlageistal, Sillectaler Alpen, Austria. The mineral is white to hight great and has a silky loster. It corpus as aggregates of minute scaller losses. It compared to the scale of the interest of the scale of the interest of the interes

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scet common forms are (110) and (100). Stardness is 5.5. Streak in coloriess. Farilits is orthoptromists, P2:22:, with a = 17.929(5), b = 17.600 [5], c = 1.02(118], \$1 = 4, 0, ... = 1.02; \$1 = 1.02(118], \$1 = 4, 0, ... = 1.02; \$1 = not included in totall, total 101,22, 0 * P 0.82, our total 100,40. The interal is maned in honor of Prof. Do. Frank Rati, late professor of size-ralogy and petrography at the Christian-Albrechts this geologic studies of the Eastern Alps. (Rarlitmen ministal, physical properties, structure, Inserticus, DTM). macticum, OTA), L. Kineral, 66, 7-6

AZEO FARAGEMENTE, PRITEGRIPHY AND SELECTED KYAMITE, ATUALUSITE, SILLIMANITE AND RELATED RIMERAL ASSEMBLAGES IN THE INCRAS PEAKS RECION, NEW MARKO.

JATERY A. Grambilog (Department of Contagy, laftery A. Grambilog (Department of Contagy, laterally of New Marko. Albequarque, NM 87134)

The Truchas Peaks region of moribura New Marko.

Icha Algalo, tripia point, andsurite occurs in rocky & im southern and of the Truchus Peaks well as the southern and of the Truchus Peaks well as the morthern park. Kyamite, and well inserted in the morthern park. Kyamite, and the lateral well as the control of the area. Near; has tripic point tone, tongade at all inserted in the contag for the area. Near; has tripic point tone, tongade at castrol ind by, topography hyamite occientations ridges, hyamite-modulation-milliantic en hillindes and figuribulion of minerals (fits a model of near-horisoptal leatherms and isobars, with pressures and tamperature lacreasing with dopth and gentheras gradients increasing from arch to secution.

100

date on the phase boundary Fe chloritated. At allicates Fe staurelite quarts at the beautite-auguste (10,) belfer, currected for minor elements, indicates temperature near 535°C. Garret-bjottie geothermometry gives a speller temperature. Felicia schize contains quart in the same use, and graphic and algebraic consists suggests that the arbitr crystalized with X(x,0) has then the arbitr crystalized with X(x,0) has then in Comparison with experience of A(x,0) has the interest of A(x,0), yields T - 140°C. Firstl. - A bber. Catchled P-7 conditions are consistent with the position of the triple point occording to Holdsway (1971). Am. Hiperit., 56, 7-8

4270 Properties of sinerals
THE DISSOCATION KIMEPICS OF SMUCLEE, ANTIGORITE, TALC, AND PHROGOFITE AT ROOM TERPERATURE AND PRESSURE
F. C. Lin and C. V. Closency (Department of
Goological Sciences, State University of New
York At Buffels, Ashierts, NY 142261

Dissolution experiments were done on a
meries of layer-type Mg minerals (Drucite,
antigorite, tale, and phiogopite) of progresstively more complex attention and chemical
repeposition. Trenty-five gram portions of
these minerals were dry-ground to 4400 mesh
and then subjected to controlled dissolution
in distilled water at 25°C and 1 stm CO2
partial pressure. For antigorite, tale,
phiogopite, Mg From the extanded and endes were
released more repidly than was 31 from the
terahedral sheets, i.e., the dissolution was
incongruent. It appears that the molumility tetrahedral sheets, i.e., the dissolution was incongruent. It appears that the solubility of these layer-type minerals is related to the relative number of octahedral to tetrahe-dral sheets present in the structure, i.e., the dissolution tinetics of layer-type slir-cate minerals is controlled by the cate of destruction of the tetrahedral silics sheets of the sinerals. (Pispolution, kinetics, phylosilicate sinerals). As. Miseral., 56, 7-8